CLAIMS

What is claimed is:

1. An ionically conductive polymeric composition for coating an implantable cardiac stimulus electrode comprising a polymer and an ionic medium admixed with said polymer, said polymer having a molecular weight large enough to avoid solubilization of the polymer or the ionic medium when an electrode coated with said composition is used for its intended purpose.

2. The composition of claim 1 wherein the polymer is chosen from the group consisting of polyethylene oxide, polyethylene terpthalate, hydrogels and polyacrylates.

3. The composition of claim 2 wherein said polymer is polyethylene oxide having a molecular weight of about 100,000-10,000,000 daltons.

4. The composition of claim 1 wherein the ionic medium is NaCl or another similarly ionizable compound that does not significantly alter a human recipient's body chemistry during the period of time that an electrode coated with said composition is implanted.

5. The composition of claim 1 further comprising a steroid.

6. The composition of claim 1 further comprising an inorganic filler.

7. The composition of claim 1 further comprising an antithrombotic, anticoagulant, anti-infection or thrombolytic agent.

8. An electrode for a cardiac stimulator comprising:

a titanium substrate electrically connected to a stimulus generator and having a porous surface structure;

a layer of an oxidation resistant metal that minimally covers said porous structure;

an electrically conductive polymeric coating that permeates said metal-covered porous structure and forms a smooth outer surface of said electrode.

9. The electrode of claim 8 wherein said metal is chosen from the group consisting of platinum, ruthenium, rhodium, palladium, osmium, iridium and alloys thereof.

The electrode of claim 8 wherein said polymeric coating comprises an antithrombotic, anticoagulant, anti-infection or thrombolytic agent.

10. An electrode for a cardiac stimulator comprising:

a titanium substrate electrically connected to a stimulus generator;

a porous electrically-conductive metal or metal oxide layer covering said titanium substrate;

an electrically conductive polymeric coating that permeats said porous layer and forms a smooth outer surface of said electrode.

11. The electrode of claim 10 wherein said porous layer is platinum black.

12. The electrode of claim 10 wherein said porous layer is a metal oxide chosen from the group consisting of oxides of platinum, ruthenium, rhodium, palladium, osmium and iridium.

13. The electrode of claim 10 wherein said porous layer is IrOx.

The electrode of claim 10 wherein said polymeric coating comprises an antithrombotic, anticoagulant, anti-infection or thrombolytic agent.

14. An implantable cardiac stimulator comprising:

an electrical stimulus generator capable of delivering a defibrillation shock;

a housing enclosing said stimulus generator, at least a portion of said housing serving as a first electrode electrically connected to said stimulus generator, said first electrode comprising a substrate and an outer surface, said substrate having a porous surface;

a second electrode electrically connected to said stimulus generator and adapted for placement in the heart, said second electrode capable of cooperating with said first electrode to deliver the defibrillation shock to the heart;

a layer of oxidation resistant metal that minimally covers said first electrode porous surface; and

an electrically conductive polymeric coating that permeates said metal-covered porous surface and forms a smooth outer surface of said first electrode.

15. The stimulator of claim 14 wherein said substrate is titanium.

16. The stimulator of claim 14 further comprising an electrically insulative coating having a window therein.

The stimulator of claim 14 wherein said polymeric coating comprises an antithrombotic, anticoagulant, anti-infection or thrombolytic agent.

17. A method of making an implantable cardiac stimulator comprising:

removing entrapped gas from the porous surface of a stimulator housing, at least a portion of said housing being an electrode comprising a metallic substrate having a porous surface;

impregnating said porous surface with a solution comprising a biocompatible polymer and a biocompatible ionic carrier;

evaporating the solvent from the impregnated surface to form a smooth polymeric outer surface of said electrode.

18. The method of claim 17 wherein said polymer is chosen from the group consisting of polyethylene oxide, polyethylene terpthalate, hydrogels and polyacrylates.

19. The method of claim 17 wherein said impregnating includes soaking said porous surface in a solution comprising 5-10% polyethylene oxide and 1-2% NaCl in alcohol.

20. The method of claim 17 wherein said impregnating includes ultrasonicating said porous surface a solution comprising 5-10% polyethylene oxide and 1-2% NaCl in alcohol.

The method of claim 17 wherein said polymeric solution further comprises an antithrombotic, anticoagulant, anti-infection or thrombolytic agent.

21. An improved method of making an implantable cardiac stimulator having one of the stimulation electrodes on a titanium housing, wherein the improvement consists of:

applying a porous coating of metal or metal oxide chosen from the group consisting of platinum, ruthenium, rhodium, palladium, osmium, iridium, and oxides thereof over said one electrode to form a porous electrode; and

permeating and covering said porous layer with an ionically conductive biocompatible polymer capable of reversible reduction-oxidation, whereby a smooth outer surface on said porous electrode is formed.

22. The method of claim 21 wherein said polymer comprises an electrically conductive ionic species.

23. The method of claim 21 wherein said polymer comprises an antithrombotic, anticoagulant, anti-infection or thrombolytic agent.

24. An improved method of making an implantable cardiac stimulator having one of the stimulation electrodes on a titanium housing, said one electrode having a porous surface structure, wherein the improvement consists of:

applying a coating of metal chosen from the group consisting of platinum, ruthenium, rhodium, palladium, osmium and iridium such that said metal coating essentially conforms to and maintains said porous structure; and

filling and covering said porous structure with an ionically conductive biocompatible polymer capable of reversible reduction-oxidation, whereby a smooth outer surface of said one electrode is formed.

25. The method of claim 24 wherein said polymer comprises an antithrombotic, anticoagulant, anti-infection or thrombolytic agent.